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[Claim(s)]

[Claim 1] A cylinder with the inhalation section and the discharge part of a refrigerant, and the roller which rolls along with the inner skin of said cylinder, In the rotary compressor equipped with the vane which comes out, removes in the condition of it being inserted in said cylinder into the slot formed in radial, and sliding on the peripheral face of said roller, and divides the interior of said cylinder into a said inhalation section and discharge part side Said vane makes base material the sintered iron which fabricated and sintered the iron system powder ingredient of the hardenability containing more than C0.4%, and was made into 15% or less of void contents Cr9%-27%. The rotary compressor characterized by having carried out martensite systematization of the base of said base material by quench-and-temper processing, and considering as the configuration which formed the Fe-N layer and the nitrogen diffusion layer in the front face in order [surface] by nitriding treatment.

[Claim 2] The rotary compressor according to claim 1 with which it is characterized by an iron system powder ingredient being SKD1 or SKD11 [SUS440A, SUS440B, SUS440C, and].

[Claim 3] A cylinder with the inhalation section and the discharge part of a refrigerant, and the roller which rolls along with the inner skin of said cylinder, In the rotary compressor equipped with the vane which comes out, removes in the condition of it being inserted in said cylinder into the slot formed in radial, and sliding on the peripheral face of said roller, and divides the interior of said cylinder into a said inhalation section and discharge part side Said vane makes

base material the sintered iron which fabricated and sintered the iron system powder ingredient of the precipitation-hardening nature containing less than [C0.2%], and was made into 15% or less of void contents Cr9%-27% and nickel4%-8%. The rotary compressor characterized by having carried out martensite systematization of the base of said base material by heat treatment, and considering as the configuration which formed the Fe-N layer and the nitrogen diffusion layer in the front face in order [surface] by nitriding treatment.

[Claim 4] The rotary compressor according to claim 3 with which an iron system powder ingredient is characterized by being SUS630 or SUS631.

[Claim 5] Sintered iron is a rotary compressor according to claim 1 to 4 characterized by forming by solid phase sintering or liquid phase sintering.

[Claim 6] The lateral portion of the vane which slides on the slot on the cylinder is a rotary compressor according to claim 1 to 5 characterized by making into a main sliding surface the nitrogen diffusion layer exposed by the grinding process.

[Claim 7] The lateral portion of the vane which slides on the slot on the cylinder is a rotary compressor according to claim 1 to 5 characterized by making into a sliding surface the mixed organization of the nitrogen diffusion layer and Fe-N layer which were exposed by the grinding process.

[Claim 8] The lateral portion of the vane which slides on the slot on the cylinder is a rotary compressor according to claim 1 to 5 characterized by making into a sliding surface the Fe-N layer exposed by the grinding process.

[Claim 9] The point of the vane which slides on a roller is a rotary compressor according to claim 1 to 8 characterized by making a Fe-N layer into a sliding surface.

[Claim 10] The point of the vane which slides on a roller is a rotary compressor according to claim 1 to 8 characterized by making into a sliding surface the Fe-N layer not more than surface roughness Ry3micrometer exposed by the grinding process.

[Claim 11] The rotary compressor according to claim 1 to 10 characterized by nitriding treatment being gas-nitriding processing or gas-soft-nitriding processing.

[Claim 12] A nitrogen diffusion layer is a rotary compressor according to claim 1 to 11 characterized by forming nitriding treatment temperature by the thickness of 0.05mm or more as 500 degrees C to 580 degrees C.

[Claim 13] The rotary compressor according to claim 1 to 12 characterized by forming an oxide film in the front face of sintered iron including a hole by steam treatment.

[Claim 14] A roller is a rotary compressor according to claim 1 to 13 characterized by creating by the cast iron material containing Cr0.5%-1.0%, Mo0.2%-0.4%, and P0.1%-0.4%.

[Claim 15] A roller is a rotary compressor according to claim 1 to 13 characterized by creating by the cast iron material containing Cr0.5%-1.0%, Mo0.2%-0.4%, and B0.02%-0.1%.

[Claim 16] The rotary compressor according to claim 1 to 15 which a refrigerant is HFC and is characterized by adding the ester oil as refrigerating machine oil.

[Claim 17] The rotary compressor according to claim 1 to 16 characterized by a refrigerant being R32.

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the suitable rotary compressor for R22 refrigerant, an R134a refrigerant, and the HFC refrigerant as an object for R22 alternative refrigerants especially about a rotary compressor.

[0002]

[Description of the Prior Art] As the conventional rotary compressor is shown in drawing 8 - drawing 9 , the motor section 2 and the compressor section 3 are arranged in the interior of a well-closed container 1, and the shaft 4 directly linked with the motor section 2 is supported by the main bearing 5 and the countershaft carrier 6 of the compressor section 3 which were prepared up and down, respectively. In the compressor section 3, the inhalation hole 8 is formed in a shaft 4 and the side face of a cylinder 7 established concentrically, and the regurgitation notch 9 is formed in the upper part. The end of a suction pipe 10 connected with the inhalation hole 8, the end of a discharge tube 12 connected with the delivery 11 formed in the upper part of a well-closed container 1, the other end of a suction pipe 10 and the other end of a discharge tube 11 have connected with an accumulator (not shown), respectively, and a refrigerant circulates through the inside and outside of a well-closed container 1. L is refrigerating machine oil as a lubricating oil which it was added by the refrigerant and liquefied within the well-closed container 1.

[0003] The roller 13 which eccentricity is carried out to a shaft 4, and it is attached in the interior of a cylinder 7, and carries out a sun and planet motion with rotation of a shaft 4 is arranged. The cylinder radial guide rail 14 is formed between the inhalation holes 8 and the regurgitation notches 9 in a cylinder 7, the tabular vane 15 inserted in this guide rail 14 is

forced on a roller 13 by the energization force and back pressure (discharge pressure) of a spring 16 at the axial center side of a cylinder 7, and the space of a batch in a cylinder 7 is in an inhalatorium 17 and compression space 18.

[0004] The vane 15 forced on the outer wall of a roller 13 in connection with it comes out and removes to radial [of a cylinder 7] inside a guide rail 14, a gas is inhaled through the inhalation opening 8 in the inhalatorium 17 divided by this vane 15, by such configuration, a roller 13 carries out a sun and planet motion in accordance with a wall inside a cylinder 7, and it is breathed [the inhaled gas is compressed by compression space 18, and] out through the regurgitation notch 37 in predetermined space.

[0005] Although nitriding treatment which is generally heat-treating and manufacturing the vane 15 into the special iron system solubility ingredient excellent in abrasion resistance, and forms grinding process finishing, a nitrogen diffusion layer, and a compound layer after heat treatment may be performed, in this case, it leaves the compound layer of the point of a vane 15, and in order to take out dimensional accuracy, grinding of the lateral portion which ****s in a cylinder 7 is carried out, and it is carrying out precision finishing.

[0006]

[Object of the Invention] However, in the vane 15 which was described above, since the nitrogen diffusion layer of the lateral portion exposed according to precision finishing is a monolayer, refrigerating machine oil cannot be held, but a result in which the abrasion resistance of a cylinder 7 and a vane 15 is a little inferior is brought. Moreover, since the special iron system solubility ingredient is used, complete processing is required, and the technical problem that processing cost is very high also occurs.

[0007] On the other hand, while the cylinder 7, the roller 13, and the sliding strip affair of a vane 15 are becoming severe and shifting to R22 (monochlorodifluoromethane) alternative refrigerant in recent years, wear-resistant high ingredient combination has come to be required more. that is, having used special steel, special casting, and iron system sintering material as the independent ingredient like the conventional vane 15 -- if -- the vane 15 formed with the special iron system solubility ingredient as abrasion resistance was inadequate and having been described above -- processing finishing -- and even if it carries out nitriding treatment, it has come to be supposed that the abrasion resistance of a cylinder 7 or a vane 15 is not enough.

[0008] This invention solves the above-mentioned problem and it aims at realizing the rotary compressor excellent in abrasion resistance in low cost.

[0009]

[Means for Solving the Problem] In order to solve the above-mentioned problem, it is made for this invention to raise the abrasion resistance of a Fe-N layer and a nitrogen diffusion layer by carrying out the amount of Cr(s) to more than 9% (mass). Moreover, it prevents that nitrogen gas permeates deeply to the interior of a vane at the time of nitriding treatment, and is made to reduce dimension distortion, a fall on the strength, and embrittlement by making a void content into 15% or less.

[0010]

[Embodiment of the Invention] A cylinder with the inhalation section and the discharge part of a refrigerant in invention according to claim 1, In the rotary compressor equipped with the vane which comes out, removes in the roller which rolls along with the inner skin of said

cylinder, and the condition of it being inserted in said cylinder into the slot formed in radial, and sliding on the peripheral face of said roller, and divides the interior of said cylinder into a said inhalation section and discharge part side Said vane makes base material the sintered iron which fabricated and sintered the iron system powder ingredient of the hardenability containing more than C0.4%, and was made into 15% or less of void contents Cr9%-27%. It is characterized by having carried out martensite systematization of the base of said base material by quench-and-temper processing, and considering as the configuration which formed the Fe-N layer and the nitrogen diffusion layer in the front face in order [surface] by nitriding treatment. nitriding treatment -- a phrase shall also include soft nitriding processing

[0011] While the abrasion resistance of a Fe-N layer improves by having made the amount of Cr(s) of a vane into 9% or more according to this configuration, the abrasion resistance of a nitrogen diffusion layer improves by leaps and bounds. Martensite systematizing becomes inadequate, even if the amount of Cr(s) exceeds 27% and it is less than 0.4%. Moreover, by having made the void content 15% or less, it can prevent that nitrogen gas permeates deeply to the interior of a vane in the case of nitriding or soft nitriding processing, dimension distortion becomes small, generating of the fall on the strength by nitriding is reduced, and embrittlement is also reduced.

[0012] In the rotary compressor of claim 1, an iron system powder ingredient is characterized by being SKD1 or SKD11 [SUS440A, SUS440B, SUS440C, and], and invention according to claim 2 is a desirable mode.

[0013] A cylinder with the inhalation section and the discharge part of a refrigerant in invention according to claim 3, In the rotary compressor equipped with the vane which comes

out, removes in the roller which rolls along with the inner skin of said cylinder, and the condition of it being inserted in said cylinder into the slot formed in radial, and sliding on the peripheral face of said roller, and divides the interior of said cylinder into a said inhalation section and discharge part side Said vane makes base material the sintered iron which fabricated and sintered the iron system powder ingredient of the precipitation-hardening nature containing less than [C0.2%], and was made into 15% or less of void contents Cr9%-27% and nickel4%-8%. It is characterized by having carried out martensite systematization of the base of said base material by heat treatment, and considering as the configuration which formed the **** Fe-N layer and the nitrogen diffusion layer in the front face in order [surface] at nitriding treatment. nitriding treatment -- a phrase shall also include soft nitriding processing.

[0014] While the abrasion resistance of a Fe-N layer improves by having made the amount of Cr(s) of a vane into 9% or more according to this configuration, the abrasion resistance of a nitrogen diffusion layer improves by leaps and bounds. Martensite systematizing becomes inadequate, even if the amount of Cr(s) exceeds 27% and it is less than 0.4%. Moreover, by having made the void content 15% or less, it can prevent that nitrogen gas permeates deeply to the interior of a vane in the case of nitriding or soft nitriding processing, dimension distortion becomes small, generating of the fall on the strength by nitriding is reduced, and embrittlement is also reduced.

[0015] In the rotary compressor of claim 3, an iron system powder ingredient is characterized by being SUS630 or SUS631, and invention according to claim 4 is a desirable mode.

[0016] Although the ingredient of liquid phase sintering is usually used in order to characterize invention according to claim 5 by forming sintered iron by solid phase sintering or liquid phase sintering in a rotary compressor according to claim 1 to 4 and to make a void content 15% or less, solid phase sintering is also possible by the additive, sintering conditions, etc.

[0017] The lateral portion of the vane to which invention according to claim 6 slides on the slot on the cylinder in a rotary compressor according to claim 1 to 5 It is what is characterized by making into a main sliding surface the nitrogen diffusion layer exposed by the grinding process. By this configuration Refrigerating machine oil is certainly held by the compound layer formed also in the inside of the hole of a nitrogen diffusion layer, and serves as a vane and a vane sliding surface which was very excellent to the adhesive wear of a cylinder by it.

[0018] The lateral portion of the vane to which invention according to claim 7 slides on the slot on the cylinder in a rotary compressor according to claim 1 to 5 It is what is characterized by making into a sliding surface the mixed organization of the nitrogen diffusion layer and Fe-N layer which were exposed by the grinding process. By this configuration In order for a gap to occur by sliding wear between a Fe-N layer and a nitrogen diffusion layer and to hold refrigerating machine oil in the gap, it becomes a vane and the vane sliding surface which was very excellent to the adhesive wear of a cylinder.

[0019] It is characterized by the lateral portion of the vane to which invention according to claim 8 slides on the slot on the cylinder in a rotary compressor according to claim 1 to 5 making a sliding surface the Fe-N layer exposed by the grinding process, and according to this configuration, since a Fe-N layer is the organization which cannot do metal agglutination very

easily, it serves as a vane and a vane sliding surface which was very excellent to the adhesive wear of a cylinder.

[0020] The point of the vane to which invention according to claim 9 slides on a roller in a rotary compressor according to claim 1 to 8 is characterized by making a Fe-N layer into a sliding surface, and according to this configuration, it becomes the wear-resistant outstanding thing very much according to the effectiveness of a chromium nitride that Cr is in 9% or more of vane material, and is contained in a Fe-N layer.

[0021] The point of the vane to which invention according to claim 10 slides on a roller in a rotary compressor according to claim 1 to 8 Are characterized by making into a sliding surface the Fe-N layer not more than surface roughness Ry3micrometer exposed by the grinding process, and according to this configuration, by sliding on a roller in the Fe-N layer not more than surface roughness Ry3micrometer It becomes the situation which it is hard coming to work big stress to a detailed height, and cannot carry out metal agglutination very easily, and becomes a vane and the vane sliding surface which was very excellent to the adhesive wear of a roller.

[0022] In a rotary compressor according to claim 1 to 10, it is characterized by nitriding treatment being gas nitriding or gas-soft-nitriding processing, and, as for invention according to claim 11, all can form a Fe-N layer and a nitrogen diffusion layer good.

[0023] In a rotary compressor according to claim 1 to 11, it is characterized by a nitrogen diffusion layer forming nitriding treatment temperature by the thickness of 0.05mm or more as 500 degrees C to 580 degrees C, and the thickness of a Fe-N layer with abrasion resistance and a nitrogen diffusion layer becomes possible by this configuration, and, as for invention

according to claim 12, after grinding can secure abrasion resistance to a nitrogen diffusion layer.

[0024] In a rotary compressor according to claim 1 to 12, invention according to claim 13 is characterized by forming an oxide film in the front face of sintered iron including a hole by steam treatment, and though it is the ingredient into which many Cr(s) with difficult nitriding are contained by this configuration, it can nitride it easily by existence of an oxide skin (tri-iron tetraoxide film).

[0025] The roller which invention according to claim 14 is characterized by creating a roller in a rotary compressor according to claim 1 to 13 by the cast iron material containing Cr0.5%-1.0%, Mo0.2%-0.4%, and P0.1%-0.4%, and consisted of cast iron material of such optimal component content of Cr, Mo, and P has very high abrasion resistance.

[0026] The roller which invention according to claim 15 is characterized by creating a roller in a rotary compressor according to claim 1 to 13 by the cast iron material containing Cr0.5%-1.0%, Mo0.2%-0.4%, and B0.02%-0.1%, and consisted of cast iron material of such optimal component content of Cr, Mo, and P has very high abrasion resistance.

[0027] In a rotary compressor according to claim 1 to 15, a refrigerant is HFC, and invention according to claim 16 is characterized by adding the ester oil as refrigerating machine oil, and can realize high-reliability also to HFC as a chlorofluorocarbon-replacing material refrigerant.

[0028] Invention according to claim 17 is characterized by a refrigerant being R32 in a rotary compressor according to claim 1 to 16. In addition, in the above, a Fe-N layer means the layer in which nitrides, such as Fe2N, Fe2-3N, and Fe3N, were formed, and a nitrogen diffusion

layer means the supersaturated solid solution to which N dissolved to Fe, or the diffusion layer in which the hard nitride of an alloy element exists. Moreover, HFC is hydro fluorocarbon and R32 is difluoromethane.

[0029] Hereafter, the gestalt of operation of this invention is explained concretely, referring to a drawing.

(Gestalt 1 of operation) Since the rotary compressor in the gestalt 1 of operation of this invention has the almost same configuration as the conventional thing explained using drawing 8 and drawing 9 , it uses drawing 8 and drawing 9 , and omits explanation of a whole configuration and actuation.

[0030] It is the configuration of the cylinder 7 containing a guide rail 14, a roller 13, and a vane 15 that the rotary compressor in the gestalt 1 of this operation is different from the conventional rotary compressor. That is, the cylinder 7 is creating the pearlite with the metal mold eutectic graphite cast iron included 10 to 50%. A roller 13 is created with the alloy cast iron which added Cr0.8%, nickel0.2%, Mo0.2%, and P0.2%, and what performed quench-and-temper is being used for it.

[0031] A vane 15 is a thing as showed the plan and the side elevation to drawing 1 (a) and (b), and it has the layer which is the following, and was made and formed in point 15a and lateral portion 15b while crossing two or more holes to the whole and having at 15% or less of void contents.

[0032] The creation approach of a vane 15 is explained. first, the powder martensitic stainless steel of the hardenability containing 16.0 - 18.0% of Cr(s), and 0.95 - 1.2% of C -- shaping --

and solid phase sintering is carried out, the base material of 15% or less of void contents is created, the quench-and-temper of this base material are carried out, martensite systematization of the base is carried out, subsequently a grinding process is carried out, and point 15a and lateral portion 15b are finished.

[0033] Next, nitriding treatment (soft nitriding processing is sufficient) of the finished base material is carried out at 560 to 570 degree C, the compound layer 20 and the nitrogen diffusion layer 21 which are a Fe-N layer are arranged in order [surface] on the base B which had a hole 19 as shown in drawing 2 and drawing 3 (a), and (b), the grinding process of the lateral portion 15b is carried out further, the compound layer 20 is removed, and it is drawing 3 (c). The nitrogen diffusion layer 21 is exposed so that it may be shown. It is made for the thickness of the nitrogen diffusion layer 21 to be set to 0.05mm or more.

[0034] Its abrasion resistance (adhesive wear-proof nature) of the nitrogen diffusion layer 21 improves sharply while the abrasion resistance of a vane [such] 15 of the compound layer 20 of point 15a improves compared with the conventional thing, when the amount of Cr(s) is 16.0% - 18.0%.

[0035] Moreover, when a void content is 15% or less, nitrogen gas does not permeate deeply to the interior of a vane 15 in the case of nitriding (or soft nitriding) processing, dimension distortion becomes small, and the fall on the strength by nitriding and brittleness-ization are suppressed. On the contrary, if it is all a continuation hole, a fall on the strength and brittleness-ization occur, and operation on a real service condition not only becomes impossible, but nitrogen gas will be spread in the vane 15 whole at the time of nitriding treatment, a big

distortion will occur in a vane 15, and it will become unusable. Therefore, it is a very important element to consider as 15% or less of void contents.

[0036] Moreover, since nitriding treatment conditions were set as 570 degrees C from 560 degrees C, the compound layer 20 and the nitrogen diffusion layer 21 are stabilized, it is formed, and the stable abrasion resistance is demonstrated. Moreover, the nitrogen diffusion layer 21 is written as 0.05mm or more, and the abrasion resistance of the nitrogen diffusion layer 21 is stabilized. When higher [nitriding treatment temperature is lower than 500 degrees C, and] than 580 degrees C, formation of the compound layer 20 will become difficult and formation of the nitrogen diffusion layer 21 will also become difficult.

[0037] Furthermore, since the compound layer 22 in a hole which is a Fe-N layer is formed also in the wall of a hole 19 at the time of nitriding treatment as it ******(ed) to drawing 4 , when dotted with a hole 19, in a hole 19, refrigerating machine oil L is held, the held refrigerating machine oil L comes to be supplied at a sliding surface at the time of sliding of a vane 15, and abrasion resistance improves. Moreover, also when that continuation hole is formed a little, the compound layer 22 in a hole will achieve the duty of sealing, it is lost, refrigerating-machine-oil oil pressure is held, and abrasion resistance of escape [the pressure added within the cylinder 7 or refrigerating machine oil L] improves more.

[0038] Therefore, a vane 15 has sufficient reinforcement, point 15a which abrasion resistance equipped with the good compound layer 20 cannot produce the adhesive wear to peripheral face 13a of a roller 13 easily with a severe sliding strip affair, and the nitrogen diffusion layer 21 of lateral portion 15b has also become the thing excellent in abrasion resistance. The roller 13 is also what was very excellent in abrasion resistance with Components Cr, Mo, and P, and

was very excellent in hardenability with nickel. Moreover, since the cylinder 7 contains the pearlite 15% or more all over Base B, its abrasion resistance is very good.

[0039] The additions of the refrigerating machine oil L which is performing lubrication are few, and it is hard to produce an oil film in the sliding surface of a guide rail 14 and a vane 15 from these things, and becomes a severe sliding strip affair in the HFC refrigerant which cannot expect lubricity to especially the refrigerant itself, and point 15a of a vane 15 and peripheral face 13a of a roller 13 are also in the rotary compressor which will be in the boundary lubrication condition near metallic contact with few oil films, and serves as a severe sliding strip affair, and high dependability can be realized.

(Gestalt 2 of operation) Although the rotary compressor of the gestalt 2 of operation has the almost same configuration as the thing of the gestalt 1 of operation, they differ in respect of the following.

[0040] The cylinder 7 is creating the pearlite by FC250 included 95% or more. The roller 13 was created with the alloy cast iron which added Cr0.8%, nickel0.2%, Mo0.2%, and B0.04%, and has performed quench-and-temper.

[0041] A vane 15 SUS631 of the precipitation-hardening nature containing less than [C0.09%] Cr16.0%-18.0% and nickel6.50%-7.75% shaping and by carrying out solid phase sintering The base material of 15% or less of void contents was created, the base was considered [after performing solution treatment and intermediate processing intermediate treatment, the deposit effectiveness processing of this base material was carried out,] as the organization where martensite and a sludge were intermingled, then the grinding process was carried out, and point 15a and lateral portion 15b are finished. And as the compound layer 20

and the nitrogen diffusion layer 21 are formed in a base B1, and point 15a of the vane 15 which ****s to the peripheral face of a roller 13 leaves the compound layer 20, and are shown in drawing 5 (a) and (b) and it shows [lateral portion 15b of the vane 15 which ****s in a cylinder 7 carries out the grinding process of the compound layer 20 and] after that drawing 5 (c) by nitriding treatment (soft nitriding processing is sufficient), the nitrogen diffusion layer 21 is exposed.

[0042] And it has the following advantages by such configuration. Since point 15a of a vane 15 is the compound layer 20 with good abrasion resistance even if the guide rail 14 of a cylinder 7 and the side of a vane 15 serve as a severe sliding strip affair and point 15a of a vane 15 and peripheral face 13a of a roller 13 become a sliding strip affair near metallic contact with few oils, it is hard to produce the adhesive wear with peripheral face 13a of a roller 13, and since lateral portion 15b of a vane 15 is also the nitrogen diffusion layer 21, it is hard to wear out. Since Components Cr, Mo, and B are very excellent in abrasion resistance and nickel is very excellent in hardenability, a roller 13 also becomes the wear-resistant outstanding thing very much in combination with a vane 15. Since the cylinder 7 also contains the pearlite 95% or more all over the base B1, abrasion resistance is very good. From these things, a reliable rotary compressor is realizable.

(Gestalt 3 of operation) Although the rotary compressor of the gestalt 3 of operation has the almost same configuration as the thing of the gestalt 1 of operation, they differ in respect of the following.

[0043] It creates with the alloy cast iron which added the component (Cr0.8%, nickel0.2%, Mo0.2%, and P0.3%), and a roller 13 performs quench-and-temper, and a cylinder 7 is A

mold flake graphite cast iron FC250, and it is creating it, having included the pearlite 90% or more.

[0044] The vane 15 created the base material of 15% or less of void contents for the martensitic stainless steel containing 0.95 - 1.2% of C, and 16.0 - 18.0% of Cr(s) shaping and by carrying out solid phase sintering, this base material is burned, and returned it, carried out martensite systematization of the base, then it carried out the grinding process, and it has finished point 15a and lateral portion 15b. And after that, nitriding treatment is performed at 560 to 570 degree C, the grinding process of point 15a of a vane 15 and the lateral portion 15b is carried out further, and point 15a is drawing 6 (a). It considers as about surface roughness Ry1micrometer, leaving the compound layer 20 so that it may be shown, and is drawing 6 (b) also to lateral portion 15b. It has left the compound layer 20 so that it may be shown. B1 is a base.

[0045] And it has the following advantages by such configuration. Since point 15a of a vane 15 is about surface roughness Ry1micrometer, in contact on the microscopic roller 13 of point 15a, Hertzian stress becomes small and does not affect wear. Moreover, since it was very hard to produce the adhesive wear with a roller 13 since point 15a of a vane 15 had left the compound layer 20, and lateral portion 15b has also left the compound layer 20, there is not only lateral portion 15b but very little wear of the guide rail 14 of a cylinder 7. Moreover, since refrigerating machine oil L is held in the hole 19 of the sliding surface of point 15a of a vane 15, and lateral portion 15b, a vane 15 becomes what was very excellent in abrasion resistance.

[0046] With the combination of such a vane 15, and a roller 13 and a cylinder 7, there is very little abrasion loss and a reliable compressor can be realized.

(Gestalt 4 of operation) Although the rotary compressor of the gestalt 4 of operation has the almost same configuration as the thing of the gestalt 3 of operation, they differ in respect of the following.

[0047] As shown in drawing 7 , it is considering as the organization for which the compound layer 20 and the nitrogen diffusion layer 21 mixed lateral portion 15b of a vane 15 by carrying out grinding of near the boundary of the compound layer 20 and the nitrogen diffusion layer 21.

[0048] Since refrigerating machine oil L is held between a thereby very hard organization (compound layer 20) and a hard organization (nitrogen diffusion layer 21), abrasion resistance improves more.

(Gestalt 5 of operation) Although the rotary compressor of the gestalt 5 of operation has the almost same configuration as the thing of the gestalt 3 of operation, they differ in respect of the following.

[0049] By creating the base material of 15% or less of void contents for the martensitic stainless steel containing 0.95 - 1.2% of C, and 16.0 - 18.0% of Cr(s) shaping and by carrying out solid phase sintering, burning this base material, returning it, carrying out martensite systematization and carrying out steam treatment of the base after that, the vane 15 forms also in the hole 19 of the surface section and the interior the oxide film 23 which consists of a tri-iron tetraoxide, as shown in drawing 8 .

[0050] And point 15a considered as about surface roughness Ry1micrometer after that by having performed the grinding process like the gestalt 3 of operation, having finished point 15a and lateral portion 15b, having performed nitriding treatment at 560 to 570 degree C, having

formed the compound layer 20, the nitrogen diffusion layer 21, and the compound layer 22 in a hole, and having carried out the grinding process further, leaving the compound layer 20, and it has also left the compound layer 20 to lateral portion 15b.

[0051] And it has the following advantages by such configuration. Although nitriding is difficult and pretreatment which removes the film of chrome oxide with hydrogen-sulfide gas, hooker nitrogen gas, etc. is required only of the usual nitriding treatment if Cr component is in the material with which many film of chrome oxide is formed like the above-mentioned vane 15, pretreatment ends in needlessness or a short time by performing steam treatment in this way.

[0052] Moreover, in order that the compound layer 22 in a hole and an oxide film 23 may remain at a minute amount to the hole 19 of the compound layer 20 after nitriding treatment, or the nitrogen diffusion layer 21, while airtightness improves, since it is porosity, the capacity to hold refrigerating machine oil L becomes large, and abrasion resistance of the tri-iron tetraoxide which constitutes an oxide film 23 improves.

[0053] In addition, it is also possible to realize the configuration of the gestalten 3, 4, and 5 of operation on a base 2.

[0054]

[Effect of the Invention] Sintered iron of 15% or less of void contents which carried out shaping sintering of the iron system powder material which has the hardenability beyond C0.4% Cr9%-27% in a vane as mentioned above according to this invention, Or sintered iron of 15% or less of void contents which carried out shaping sintering of the iron system powder

material with the precipitation-hardening nature not more than C0.2% is made into base material Cr9%-27% and nickel4%-8%. Martensite systematization of the base was carried out, and it wrote as the configuration in which the Fe-N layer and the nitrogen diffusion layer were formed on the front face, and it not only excels in abrasion resistance extremely, but it excelled in mass-production nature and offer of the vane of low cost was attained. Such a vane is useful also to a future chlorofluorocarbon-replacing material refrigerant.

[0055] Moreover, sintered iron could be written as base material, all processings could be performed only by the grinding process, and drastic process reduction and management reduction also became possible. With the conventional sintered iron which only prepared the hole, there was a problem of reinforcement and dimension distortion, and although fertilization was difficult, these problems were also solved by having considered as 15% or less of void contents. Moreover, it became possible to make the duty of sealing achieve and to make refrigerating machine oil hold by forming a Fe-N layer also in a hole, in abrasion resistance, it is large and improvement of it was attained.

[0056] From these things, a very reliable rotary compressor is realizable.

[Brief Description of the Drawings]

[Drawing 1] The explanatory view having shown the top face and side face of a vane which constitute the rotary compressor in the gestalt 1 of operation of this invention

[Drawing 2] The sectional view in the middle of manufacture of the vane of drawing 1

[Drawing 3] The sectional view in the middle of manufacture of the point of the vane of drawing 1 , and a lateral portion at the time of completion

[Drawing 4] The expanded sectional view of the vane of drawing 1

[Drawing 5] The sectional view of the point of the vane which constitutes the rotary compressor in the gestalt 2 of operation of this invention, and a lateral portion

[Drawing 6] The sectional view of the lateral portion of the vane which constitutes the rotary compressor in the gestalt 3 of operation of this invention

[Drawing 7] The sectional view of the lateral portion of the vane which constitutes the rotary compressor in the gestalt 4 of operation of this invention

[Drawing 8] The sectional view of the lateral portion of the vane which constitutes the rotary compressor in the gestalt 5 of operation of this invention

[Drawing 9] Drawing of longitudinal section showing the whole outline configuration of a certain rotary compressor conventionally

[Drawing 10] The cross-sectional view of this rotary compressor

[Description of Notations]

7 Cylinder

8 Inhalation Hole

9 Regurgitation Notch

13 Roller

14 Guide Rail

15 Vane

15a Point

15b Lateral portion

19 Hole

20 Compound Layer (Fe-N Layer)

21 Nitrogen Diffusion Layer

22 Compound Layer in Hole

23 Oxide Film

B1 Base

B-2 Base